Payload Scenarios

- Payload Scenarios developed to ‘run through’ candidate Utilization Management Models

- Payload Scenario Set selection based on:
  - Experience with payload (has flown or will fly near-term)
  - Knowledge of payload (payload is well enough defined to assess payload flow through model)
  - Manageable number of scenarios (set of payloads can be assessed in time allowed)
  - Breadth of set

Payload Scenarios, cont'd

- Payload Scenarios to reflect the breadth of experiments on ISS in terms of:
  - Development complexity
  - Payload classification (e.g. facility, subrack/subpallet, experiment unique)
  - Payload developer (International Partner, NASA, commercial)
  - Interface complexity (e.g. hardware/software suites, deployed hardware)
  - Interface location (pressurized verses un-pressurized)
  - Duration of manifest aboard ISS
  - Standard verses non-standard interface
  - International Partner module location(s)
  - Multi-use

Recommended Payload Scenario Set

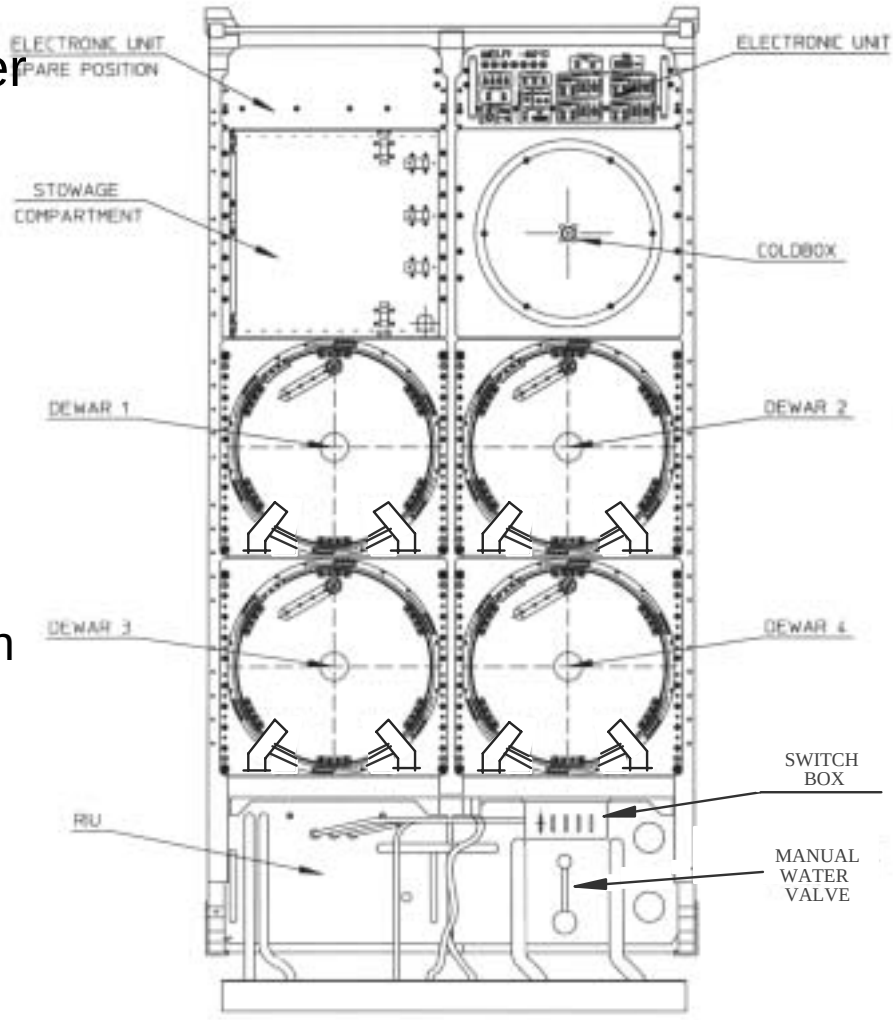
- Facility Class:
  - Space Station Biological Research Project (SSBRP) Suite
  - Minus 80 Degree Laboratory Freezer for ISS (MELFI)
- EXPRESS sub rack:
  - Physics of Colloids in Space (PCS)
  - Advanced Astroculture (ADVASC)
- Non-Standard Attached Payload:
  - Materials on ISS Experiment (MISSE)
- Truss Attached:
  - Alpha Magnetic Spectrometer (AMS)
- EXPRESS Pallet Payload:
  - Stratospheric Aerosols and Gas Experiment (SAGE) III

Space Station Biological Research Project (SSBRP) Suite

- The Facility consists of a suite of Racks including two Habitat Holding Racks, the Life Science Glovebox, the Centrifuge Rotor and Habitats that are house in them
  - This is a complex set of racks and subracks. The operations concept requires the habitats to be interchangeable between the HHR, LSG and CR which drives up-front integration activity
  - The LSG and CR are developed by NASDA and the HHRs are US developed that requires coordination of development activities
  - HHRs will be launched and installed in the US Laboratory and moved to Centrifuge Accommodation Module
  - SSBRP is a heavy user of conditioned assets on-orbit and in the transport phase
  - The requirement for live animals is unique and must meet minimum requirements
  - Heavily crew intensive requires extensive operational preparation and executional support
  - Life science requirements drive heavy use of the Orbiter Middeck

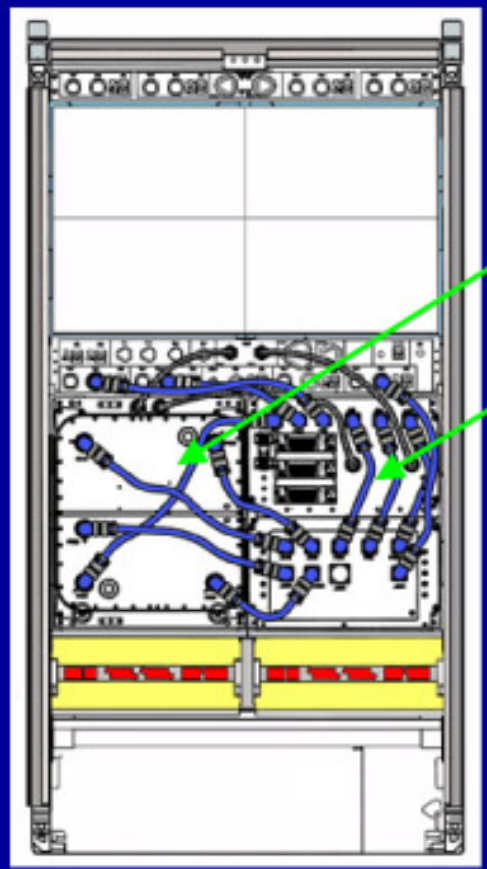
Minus 80 Degree Laboratory Freezer for ISS (MELFI)

- The MELFI is a three rack series obtained through an international barter that rotate up, down and on-orbit
  - MELFI hardware development (Brayten cycle engine and conductive cooling) was one of the more complex technical challenges
  - MELFI supports Multi-user customer base that have to be integrated and managed in real-time across the increment
  - MELFI is powered on ascent/ descent in Multi-Purpose Logistics Module which requires non-standard interfaces and processes
  - MELFI is designed to operate in the US Laboratory and Japanese Experiment Module system rack location



EXPRESS Sub-Rack Payloads
Physics of Colloids in Space (PCS)

- Studies the formations of colloid lattices and large scale fractal aggregates and the physical properties and the dynamics of these formations
- This is a complex EXPRESS payload consisting of multiple lockers communicating with each other and the EXPRESS Rack
- Samples require Early access on return



EXPRESS Rack

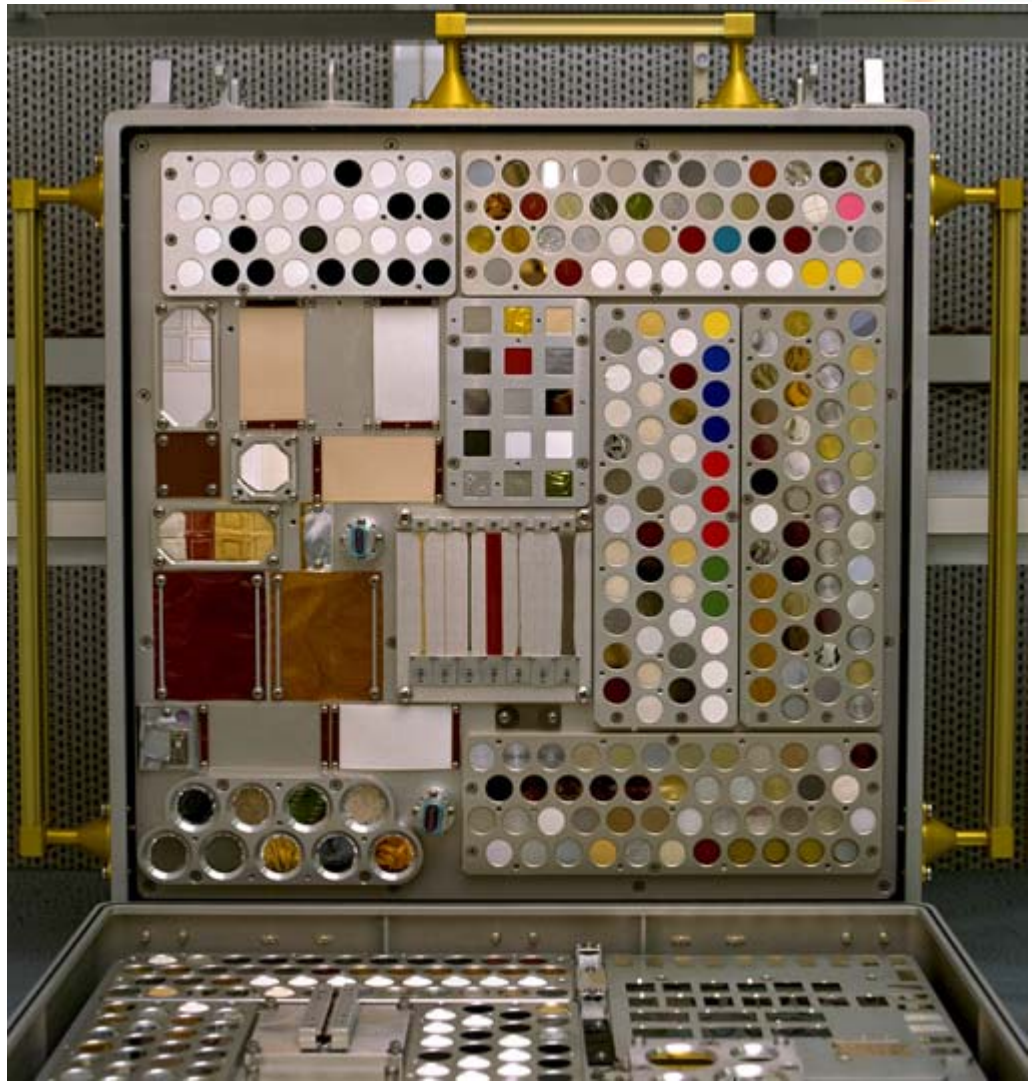
- 2 Units each occupying the volume of two Middeck Locker Equivalents.
  - Test Section: Sealed container that holds the 8 colloid samples and all the diagnostic instrumentation.
  - Avionics Section: 2 drawer assembly containing the electronics and software for the power distribution, control, data acquisition and telemetry.
- Mission Operations conducted out of the GRC Telescience Support Center (TSC) with a Remote Telemetry Data Site at Harvard University.
- Long term study of the nucleation, growth and formations of the colloid samples using imaging and light scattering diagnostics.

EXPRESS sub rack: Advanced Astroculture (ADVASC)

- ADVASC plant growth unit is two single middeck inserts to be installed in an EXPRESS rack
  - One insert, the ADVASC-SS, contains the computer, electronics and other support systems
  - The other insert, ADVASC-GC, contains an enclosed and environmentally controlled plant growth chamber and ancillary subsystems
- Specifically designed without the requirement for transportation power, i.e., ascent and descent power
- Space Product Development sponsored Commercial Payload which has been flown on Increments 2, 4 and 5

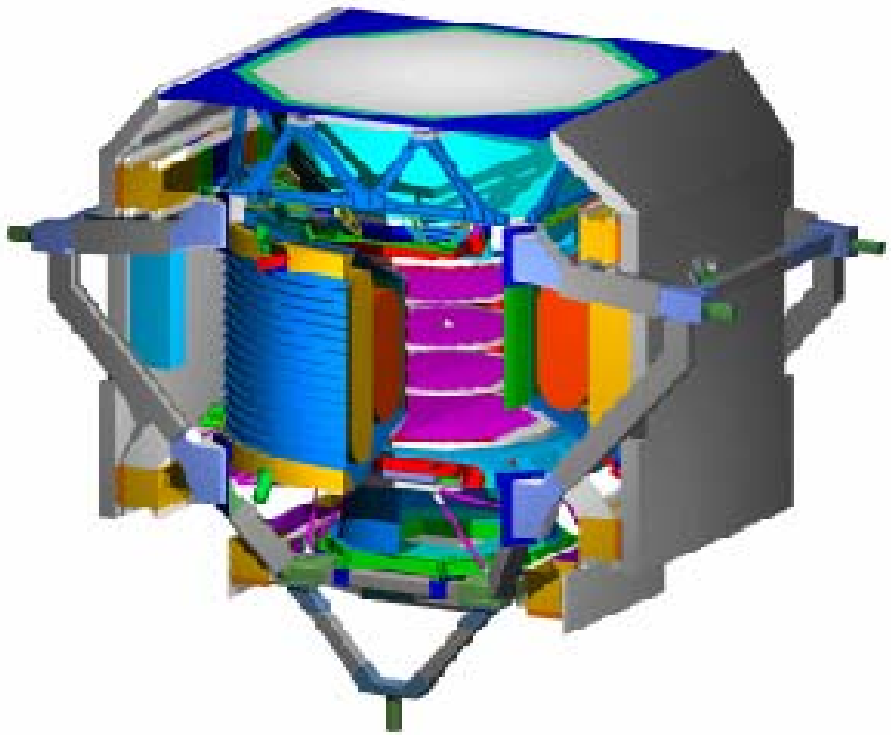
Non-Standard Attached Payload Materials on ISS Experiment (MISSE)

- Non-standard attached payload requires unique ICD and engineering analyses
- EVA deploy/retrieval requires special crew procedures and training
- No crew involvement or resources required once deployed
- Requires unique Flight Support Equipment (FSE) and unpressurized carrier



Truss Attached
Alpha Magnetic Spectrometer (AMS)

- Complex development based on the state of the art magnet and component technology, and multi-nation partnership
- Complex integration requires unique engineering analyses (mass/c.g., envelope, magnetic radiation, view to space)
- Complex Shuttle integration of a major cargo element requires coordination with other ISS elements and the Orbiter
- Robotic installation/retrieval integration performed by Mission Operation Directorate not OZ



EXPRESS Pallet Payload Stratospheric Aerosols and Gas Experiment (SAGE) III

- The SAGE III is a complex instrument with a grating spectrometer that measures ultraviolet/visible energy
  - Critical viewing and timing requirements
- Integration made complex with the addition of the HEXAPOD pointing system as part of a barter with ESA
- The instrument is sensitive to contamination due to the ISS environment, particularity during space shuttle visits when contaminant levels are expected to be much higher
- Science requirement to have concurrent data with the SAGE III Meteor 3M mission